

The Application of the Multiple Points of a Mold Function of UG MoldWizard in the Design of Cutting Compressor

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Abstract—In recent years, mold industry develops rapidly. The design and manufacture of mold have become an important symbol to measure the level of a country's manufacturing industry. Difficult point in the design of the cutting compressor for recycling plastic bottles lies in cutting and compressing plastic bottles at the same time. Use UG MoldWizard to design the working process of injection mold. Design and manufacture the U-lower plastic mold with the aid of a computer. Make optimal design plan of the U-lower plastic in the cutting compressor.

Index Terms—UG MoldWizard, mold design, multiple points of a mold, cutting compressor, U-lower mold

Users can easily make calls according to their needs, but also can carry out the development of standard parts. This greatly improves the efficiency of mold design. Module provides the whole mold design process, which include product loading, qualifying layout, type, mold loading, gating system, cooling system and engineering drawing etc... The whole design process is very intuitive and fast. Its application is designed so that ordinary designers can also complete some of the high difficulty of the mold design. It can be reflected more especially in the development of multiple points of a mold .In this paper, the U-lower mold of cutting compressor is used as an example to introduce the multiple points of a mold design characteristics of UG.

I. OVERVIEW

UG(Unigraphics NX)is an engineering solution produced by Siemens PLM Software. It provides digital modeling and verification methods for the product design and processing of the user. It is more popular mold design software now for its powerful function.

MoldWizard is developed on the basis of NX. It is a professional module for injection mold design. There are the commonly used mold base and standard parts in the module.

II. MOLD DESIGN PROCESS OF UG MOLDWIZARD

The mold design is according to the performance of the basic requirements of plastic parts and plastic process carefully analyzing the technology of the plastic parts, correctly determining the molding method and molding process, selecting suitable plastic injection molding machine, then designing the plastic mold. Based on this idea using UG MoldWizard to make mold design is following the general process, as shown Fig.1.

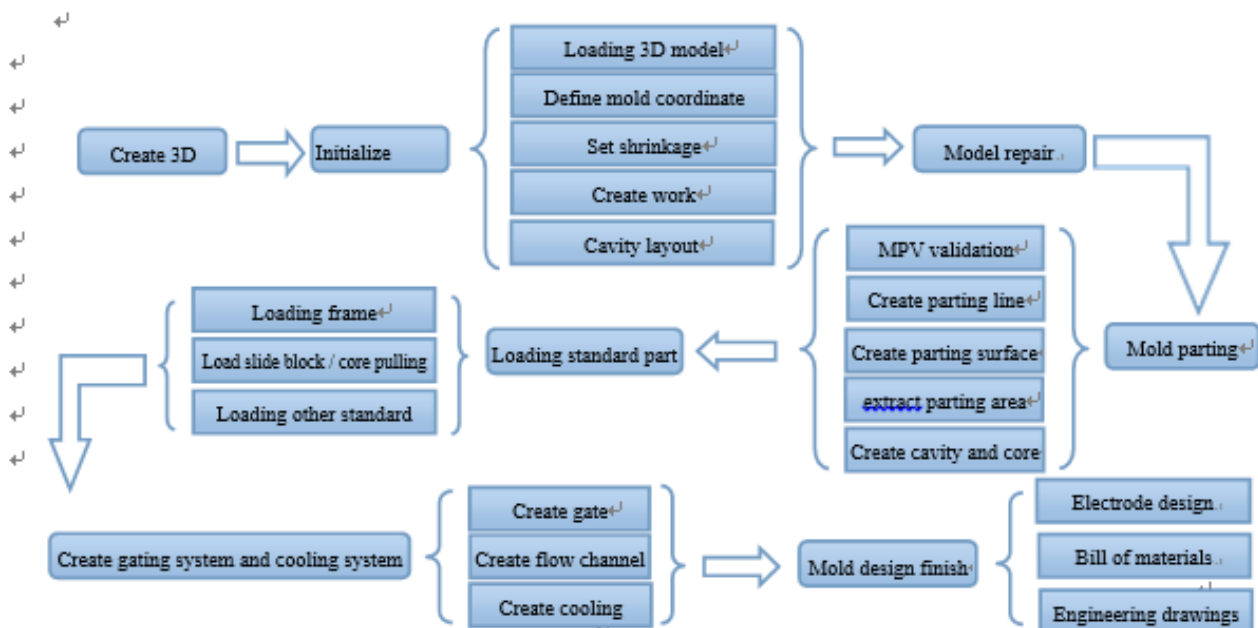


Fig.1 General Process of mold design

Source of project: Innovation project of Shanghai College Student (cs1401004)

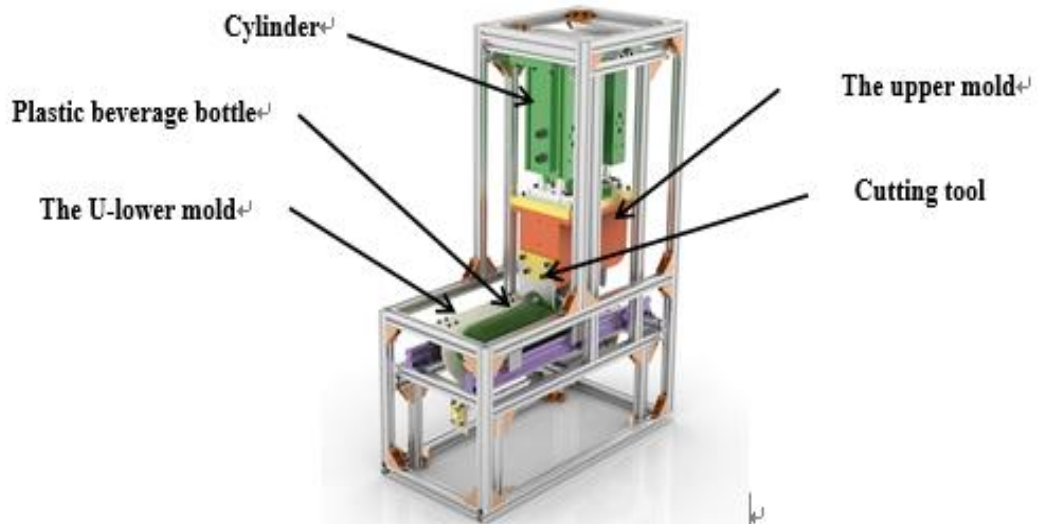


Fig.2 Model of cutting compressor

III. DESIGN EXAMPLE OF MOLDWIZARD

In this paper, the U-lower mold of cutting compressor is used as an example to introduce the process and technology key points of the multiple points of a mold design in MoldWizard ,and finally process the corresponding 3D solid mold.Fig.2 is the schematic diagram of the overall structure for the cutting compressor. This equipment is mainly aimed at the recyclable plastic beverage bottle, solving the storage problem of the beverage bottle in the process of recovery and utilization, and improving the resource recovery rate and reduces the transportation cost of beverage bottles. The cutting compressor mainly cuts and separates the bottle body and the bottle cap of the conventional beverage bottle .This requires that the upper and lower modules of cutting and compressing mechanism is to ensure that the upper and lower stamping modules and tool movements can be well matched in punching and cutting. Therefore, it is very important to design the shape of the upper and lower punching modules and the location of the cutting tool. The cutting and compression mechanism in Fig.2 is the core of the whole cutting compressor; it is the key part of the specified action to be completed in accordance with the operating instructions. Use floating cutter cutting to make sure the cutter can be well extended from the upper module. The connecting rod of the cutter is not interfered by the inner cavity of the upper pressure module. Therefore, the pouring molding quality of the upper and lower U mold has a direct influence on the cutting quality of the cutting compressor.

IV. INITIALIZING PROJECT

Initializing project is the source of the mold design in using MoldWizard.It is mainly assembling the product model into the mold module, which plays a key role in the whole mold design. Its operation will affect the follow-up work of the mold design. So the structure and material of the model should be carefully analyzed before the initialization of the project. It mainly includes the loading of the product model, the definition of the mold coordinate system, the set of the contraction rate and the creation of mold parts.

A. Mold coordinate system

The mold coordinate system is very important in the whole design, It is not only the reference standard of all the parts of the mold assembly, but also directly affect the structure design of the mold. So before the definition of the mold coordinate system, we must first analyze the structure of the product, and confirm the parting direction of products and that parting surface plane is located in parting surface. Secondly, move and rotate the product coordinate system to the same position with the mold coordinates. Finally, click the "mold coordinate system" button of the "mold Wizard" tools to lock coordinates[1].As shown in Fig.4, Coordinate origin in semi-circle at the center of the surface of the U-lower mold, so that both can guarantee the quality of the U-curved mold, and can ensure uniform density of the U-mold.

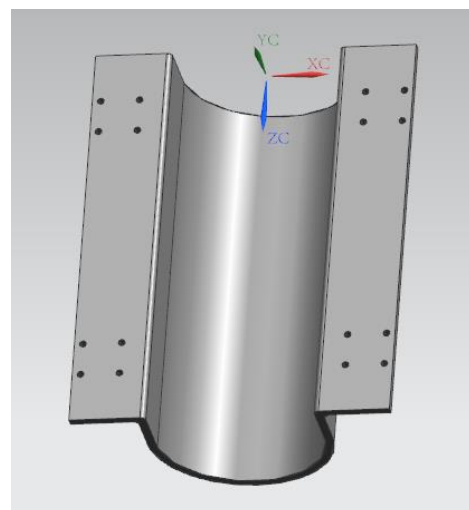


Fig.3 Locked mold coordinate system

B. Set shrinkage

After taking out the injection parts from the mold, the plastic part will shrink for the temperature and pressure changes. To this end, UG software dedicated to providing a function of shrinkage rate to correct the size deviation caused by the volume shrinkage of injection molded parts. The size

deviation is influenced by various factors, such as the variety of plastic, the structure of the product, the structure of the mold and the molding process. Combining with the actual situation of the work, the shrinkage rate is set as the scale factor 1.006, as shown in Fig.4.

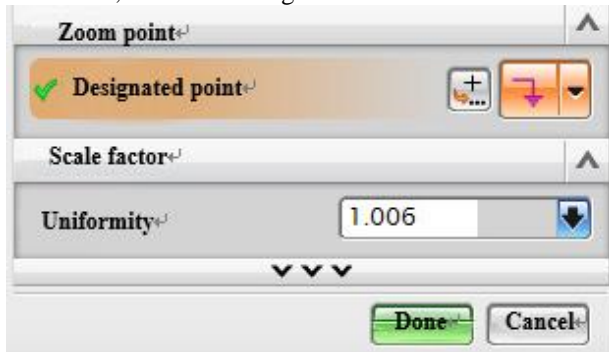


Fig.4 Shrinkage setting

V. CAVITY LAYOUT

The "cavity layout" commands can make mold design of multiple points of a mold. The number of products in general molding is much. When defining a mold cavity layout, It can comprehensively consider the structural characteristics of the product model, the number of products, the feasibility of the economy and the degree of difficulty in processing and other factors to determine the layout and number of cavity. The layout of the mold cavity is rectangular or circular. As shown in Fig.5, because the model is still in the experimental stage and need is less, this example uses a rectangular layout of four.

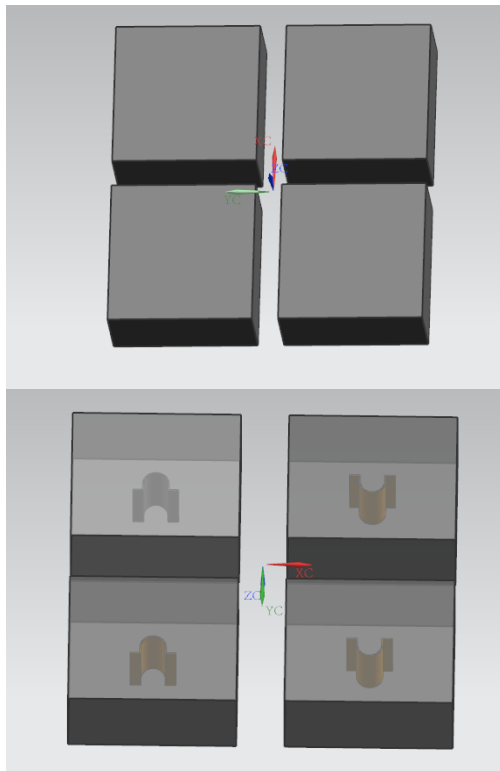


Fig.5 Define cavity layout

VI. MOLD PARTING

Parting is one of the most important steps in die design. Parting good or bad directly affect the subsequent mold design [2]. Through the mold parting mold design can be completed a lot of work. It mainly includes the analysis of the

product model, parting line, parting surface, type core, cavity creation, editing, and design changes, etc... In **MoldWizard**, its parting feature provides a tool fast parting and maintaining the parameters related, and its function is very powerful. It can help the user to quickly and accurately analyze the models and part the mold [1]. As shown in Fig.6. In this case, we create a parting surface on the end of the U-lower mold, and select the Z direction for the parting direction.

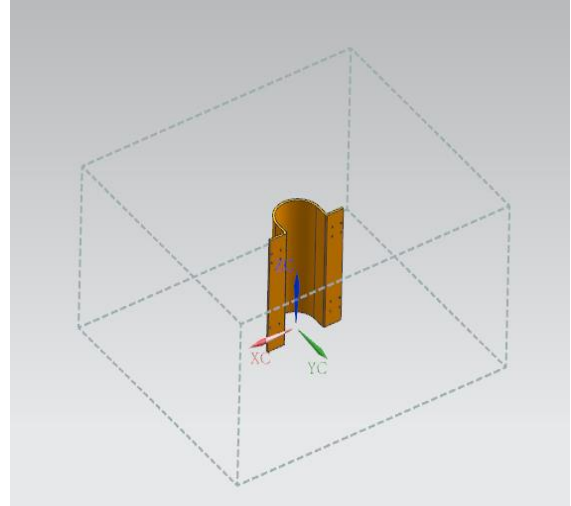


Fig.6 The parting direction

VII. ADD FRAME

Frame is the base of the mold, its effect as follows:

- 1) Lead molten plastic flow into the mold cavity from the injection nozzle.
- 2) Fixed forming element of mold plastic parts.
- 3) The whole mold is reliably installed on the injection machine.
- 4) Adjust mold temperature.
- 5) The casting part is pushed out from the mold.

In order to adapt to different types of mold design projects, UG not only included form work systems of the world famous standard mold frame manufacturer, also includes an interchangeable mold and common mold frame. And module is also provided with a custom mold function, users can define their own mold, provides many conveniences for mold designer. It greatly improves the design efficiency of the mold system. This example uses the 2A type mold of DME, as shown in Fig.7.

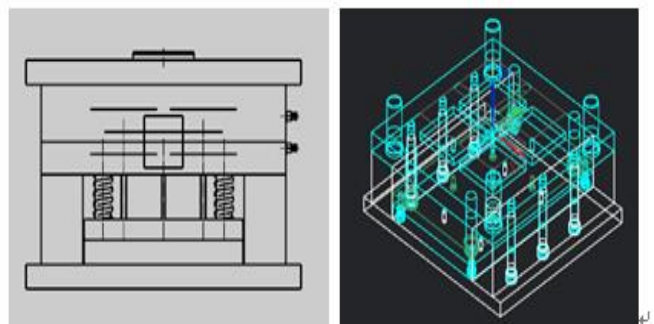


Fig.7 2A type mold

VIII. ADD STANDARD PARTS

After the completion of mold, there are also a large number of standard parts to add. Mold standard part refers to the part of parts have been standardized; this part of the parts can

replace, so as to improve the production efficiency of the die and the repair efficiency. As shown in Fig.8. In this example, the standard parts we need to add are: positioning ring, the gate sleeve, and the top rod, limit nails, spring.

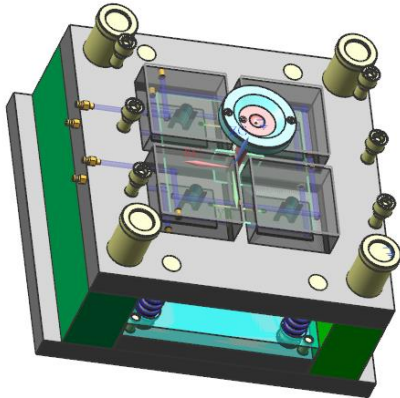


Fig.8 Add standard parts

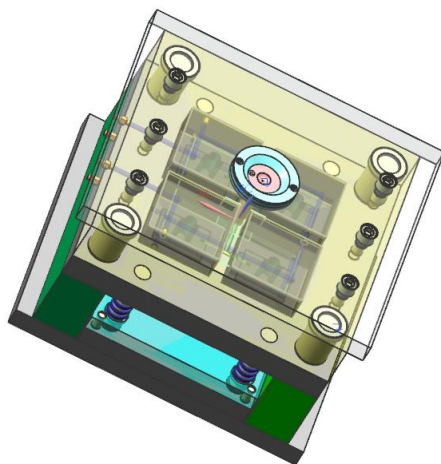


Fig.9 Mold assembly drawing



Fig.10 material object of U-lower mold

At this point, the mold design has been completed, the overall assembly of the mold as shown in Fig.9. Compared with the traditional mold design, UG MoldWizard provides a good mold design simulation help for the persons that lack of experience in mold design so that they can master the skills of mold design faster. Make people design a more standardized mold products. Fig.10 is material object of U-lower mold. Through the design of MoldWizard UG module, the U-lower mold is produced. When it is used in the project, there is no bending, fracture and other phenomena. There is no interference between the parts. It achieves the desired requirements well. Features of UG Mold Wizard module, for mold beginners, especially for students who do not have experience, it provides a more intuitive design, to help them get started.

IX. CONCLUSIONS

The design concept of UG, to provide integrates design, manufacturing, assembly and production. It makes a design and manufacturing integrity idea for plastic mold. Its powerful function provides a powerful tool for the project staff to complete the high quality and majority of the mold product development in the short term. Its humanized design puts forward a lot of valuable opinions at the beginning of design and design for the project part. Its excellent performance will replace the traditional design method and become the trend of the times. To promote the product update cycle is shortened, and to reduce the investment before the product is put into production.

REFERENCES

- [1] Beijing trillion Di Technology Co., Ltd. NX9.0 UG Mold Design Tutorial. Beijing, China Water Power Press, 2014.4.
- [2] WANG Yingchun. Research on UG Application in Plastic Injection Mold Design. Suzhou Institute of Industrial Technology. Information Technology, 2010.08.09.
- [3] Chen qingyun. Analysis Of Reverse Modeling Design Based On UG. TECHNOLOGY AND MARKET, vol.19, no.12, 2012.
- [4] RAO Xixin, FU Hang, WANG Jiaxi, XIE Dacheng. Parametric Modeling for Ventilator Blade Based on UG. Journal of Nanchang University (Engineering & Technology), vol.32, no.4, 2010.
- [5] YANG Jiali, LIU Hesheng, HUANG Xingyuan. The Application of UG Injection Mold Design System in Mold Design and Manufacture. Journal of Nanchang University (Engineering & Technology), vol.32, no.2, 2010.
- [6] Jin Caishan. Forging die design of gear blank based on UG NX. FORGING & STAMPING TECHNOLOGY, vol.39 no.5, 2014.
- [7] SONG Shuangzhu. Camera Shell Injection Mold Design Based on UG and Mold Flow. Journal of Harbin University of Science And Technology, vol.14, no.3, 2009.
- [8] CHEN Yongdang, BAO Zhiqiang, REN Huijuan, WANG Yuxin. Finite Element Analysis for Product Design Based on SolidWorks Simulation. COMPUTER TECHNOLOGY AND DEVELOPMENT, vol.22, no.9, 2012.
- [9] ZENG Wenzhong. SolidWorks based on the mechanical parts of structure design and application. Manufacturing Automation, 2012.2.

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